

FIG. 1

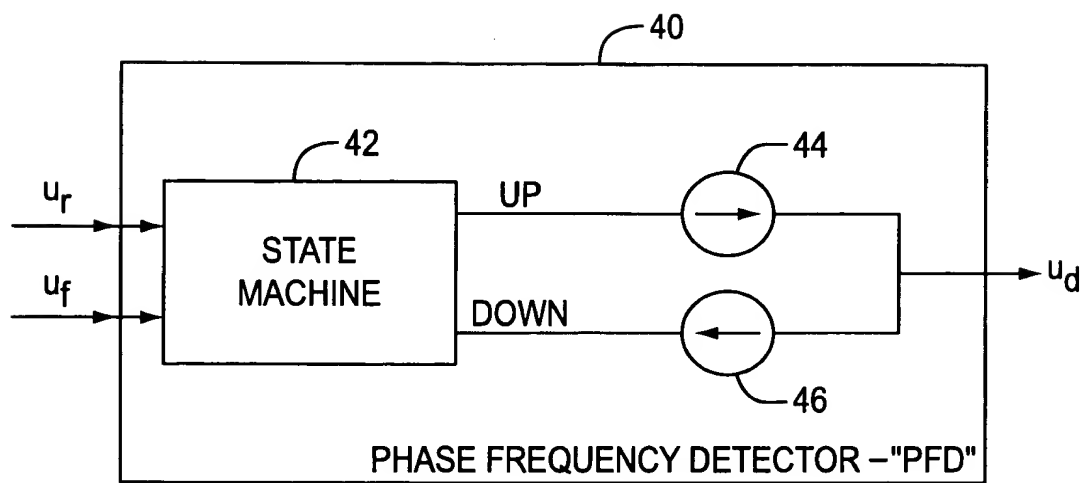


FIG. 2

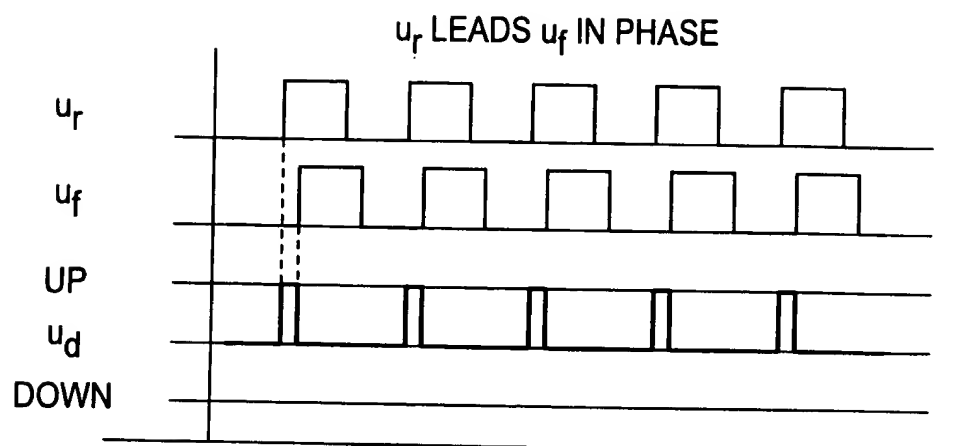


FIG. 3A

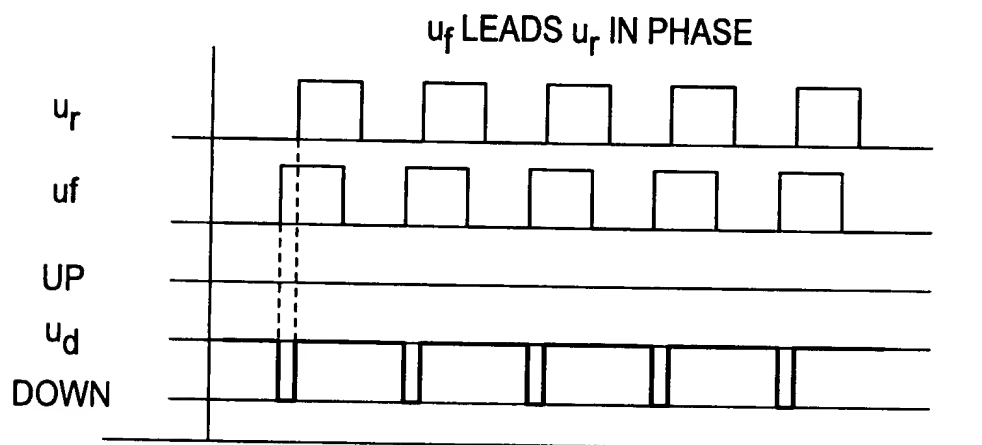


FIG. 3B

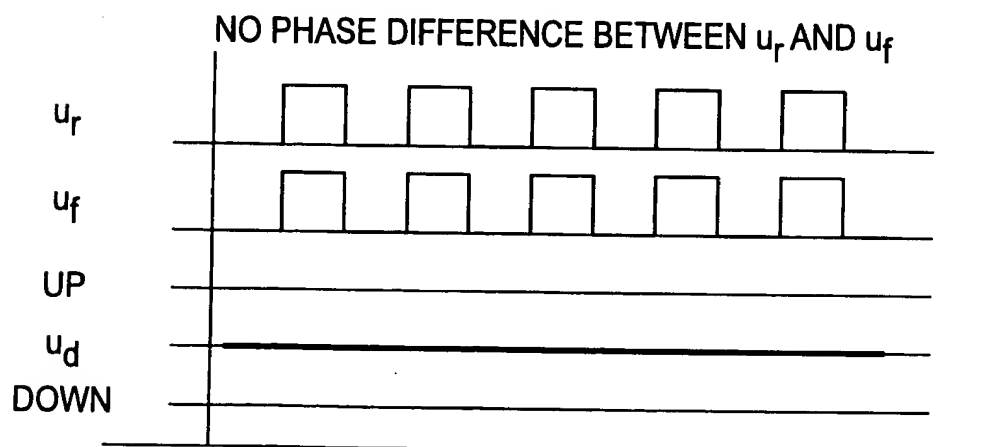


FIG. 3C

$u_r - u_f$	$u_r - u_f$	$u_r - u_f$	$u_r - u_f$	UP	DOWN
0-0	0-1	1-1	1-0		
(1)	2	2	(1)	0	1
3	(2)	(2)	6	0	1
(3)	4	5	6	1	1
8	(4)	5	7	1	1
3	2	(5)	7	1	1
1	2	5	(6)	1	1
3	4	(7)	(7)	1	0
(8)	(8)	7	7	1	0

PFD STATE TRANSITION TABLE

FIG. 4

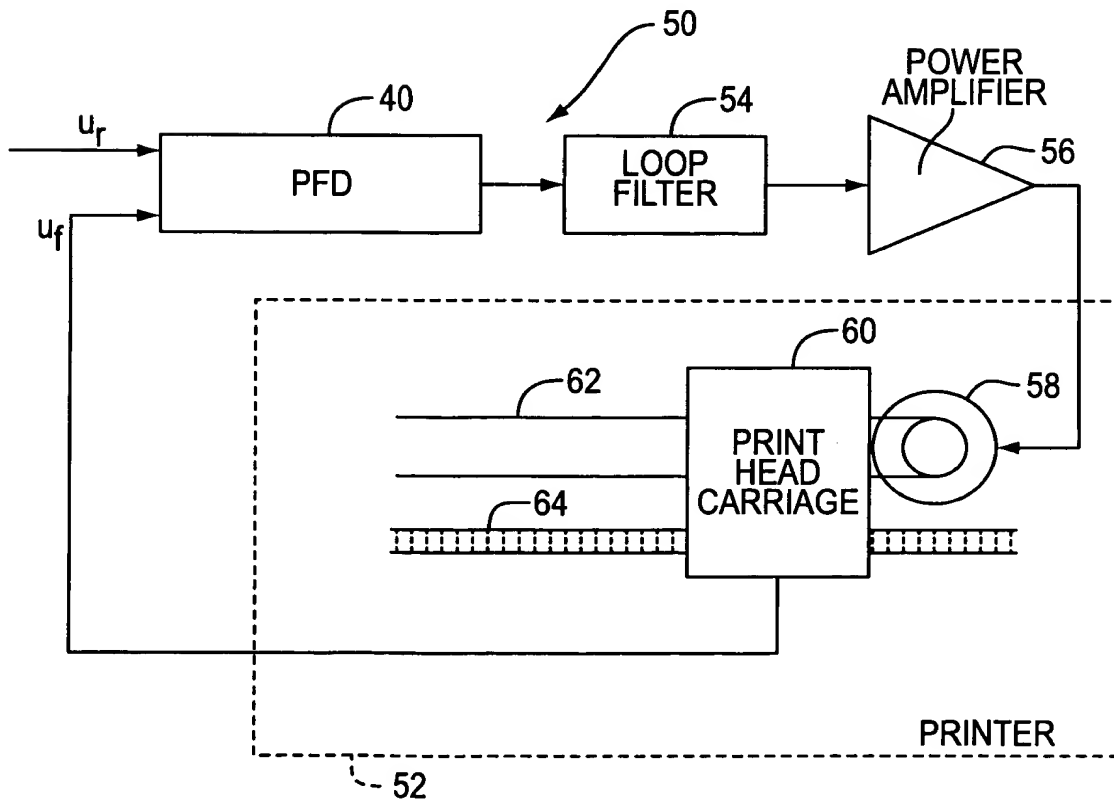


FIG. 5

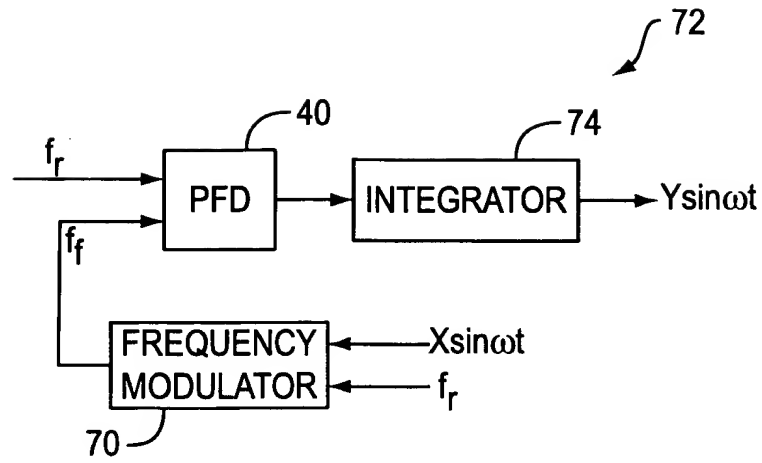


FIG. 6

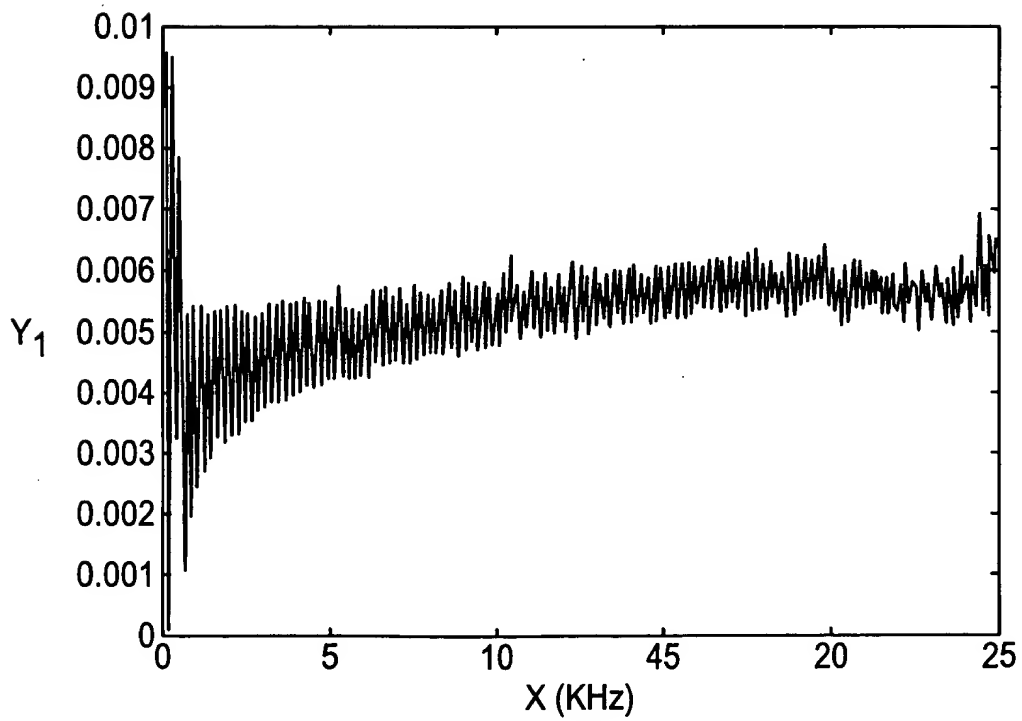
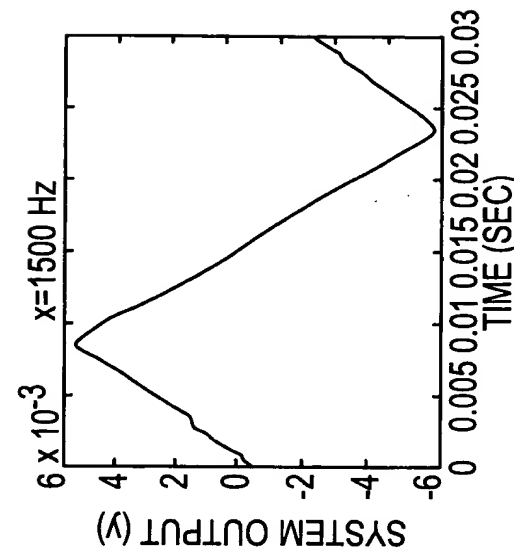
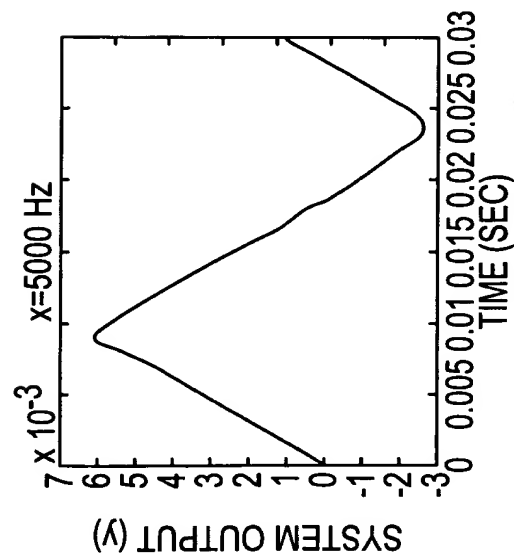
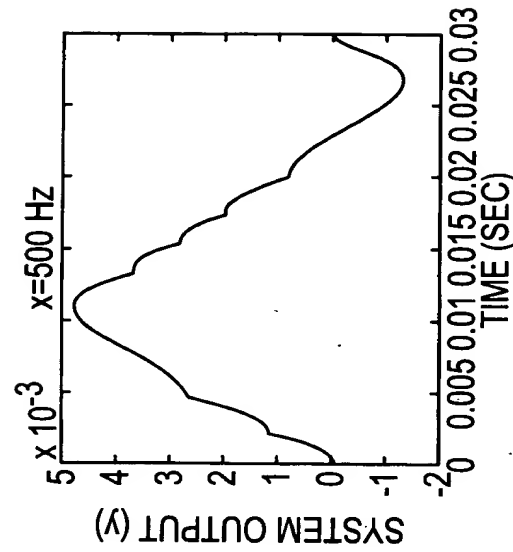
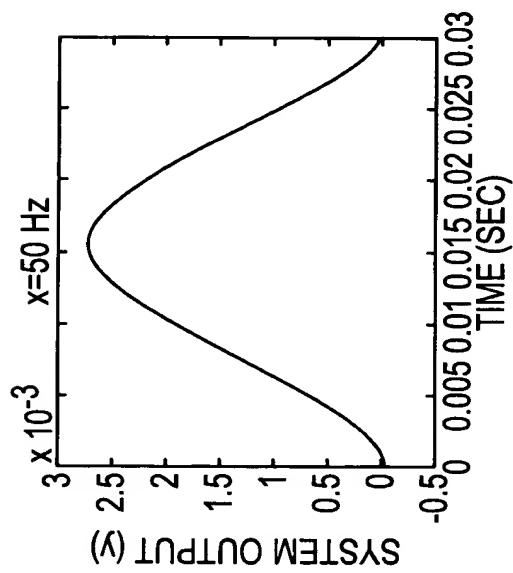


FIG. 8



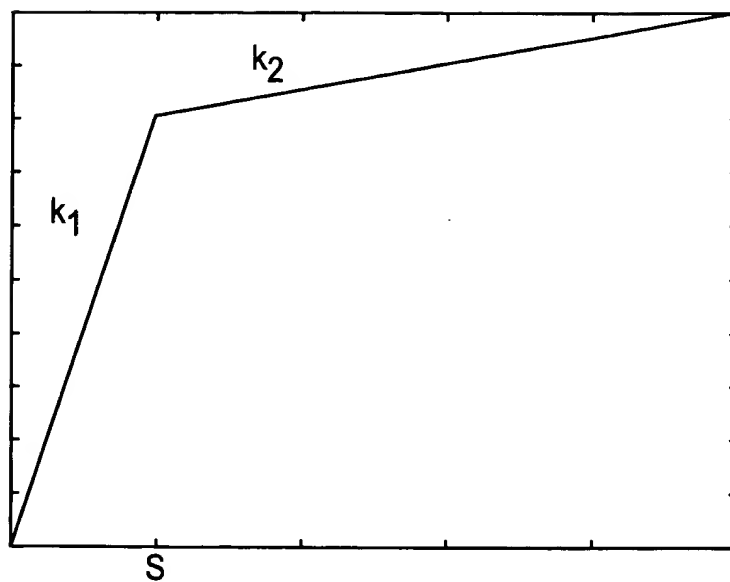


FIG. 9

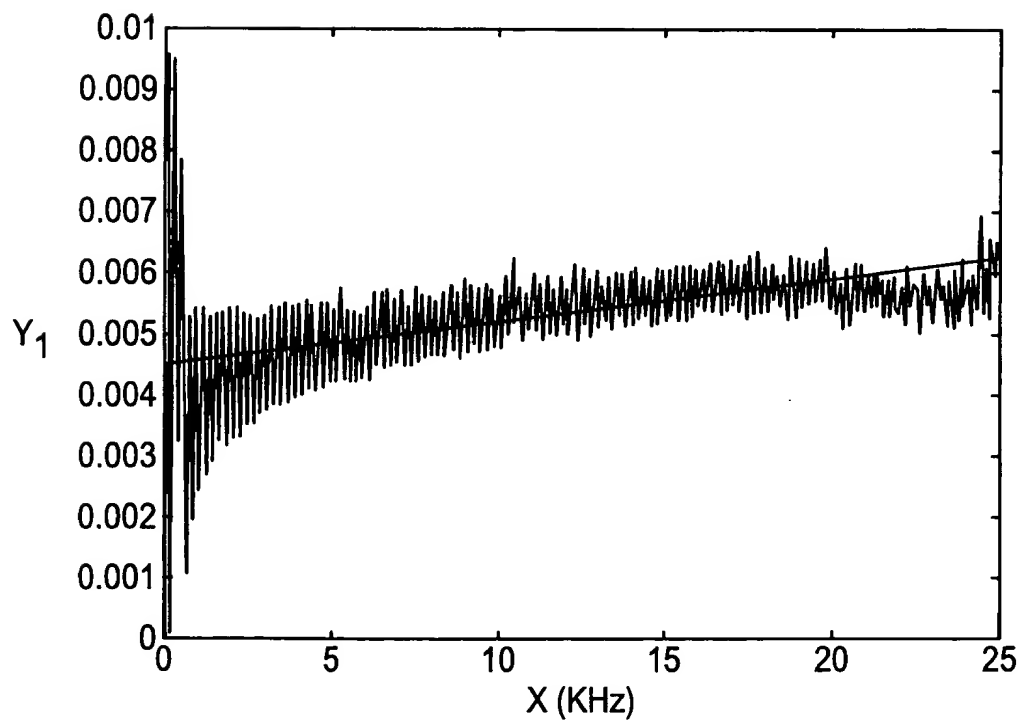


FIG. 10

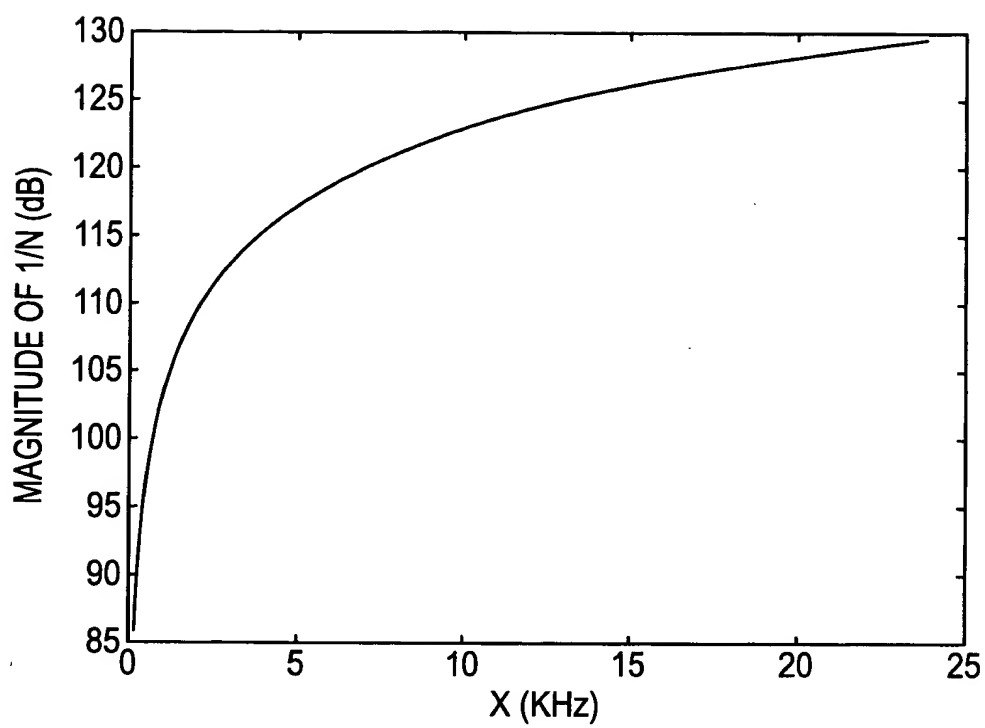


FIG. 11

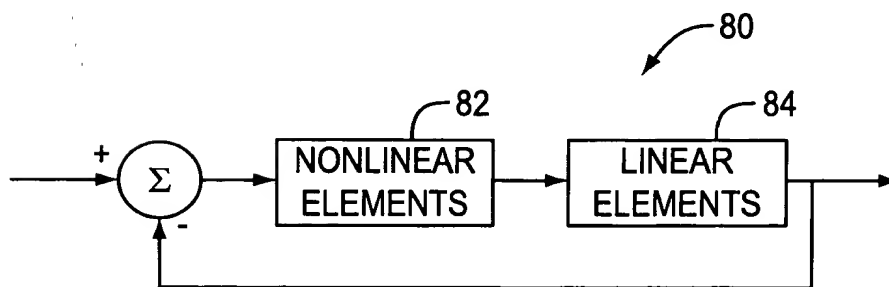


FIG. 12



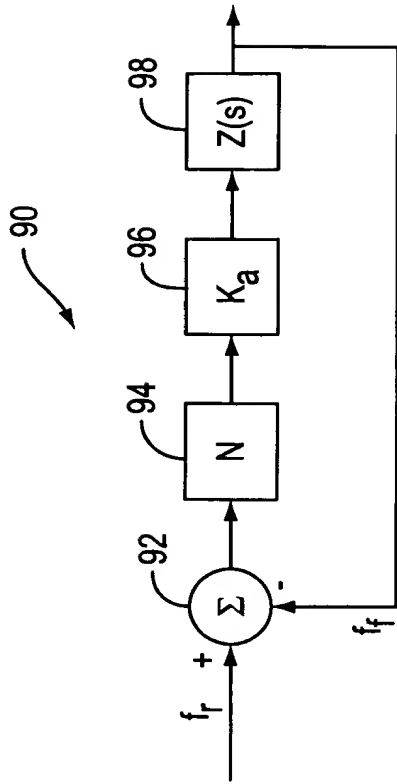


FIG. 13

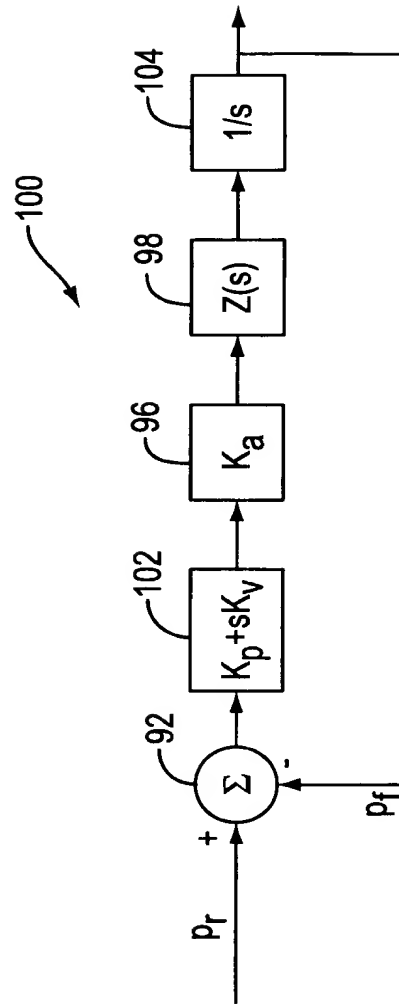


FIG. 14

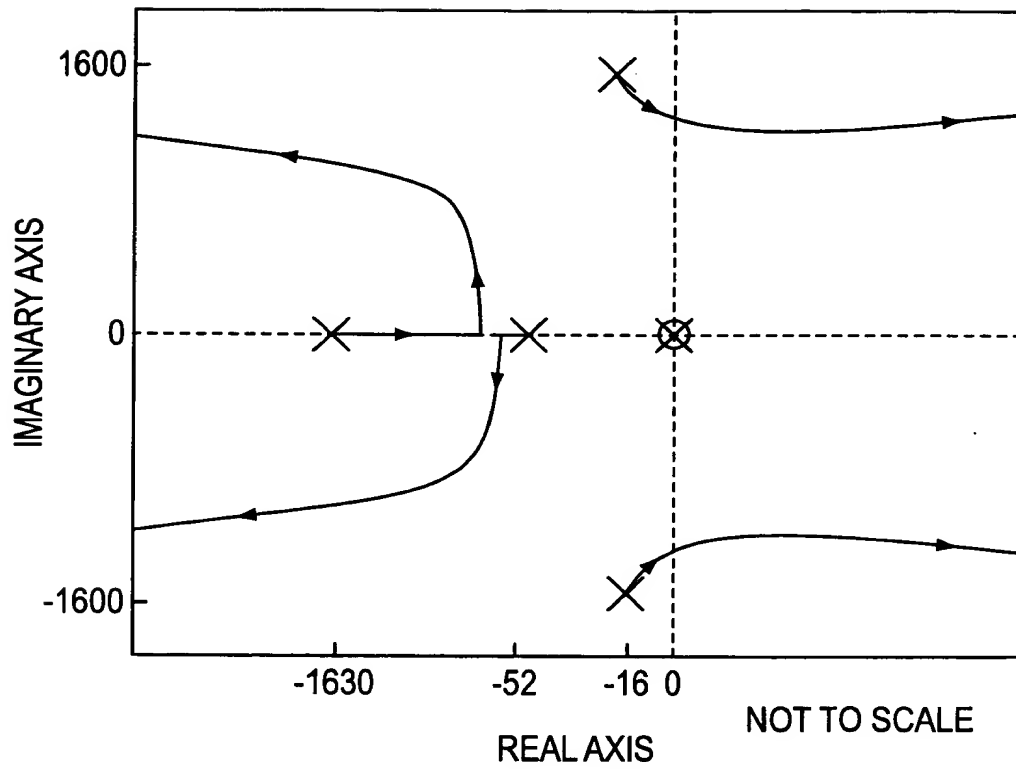


FIG. 15

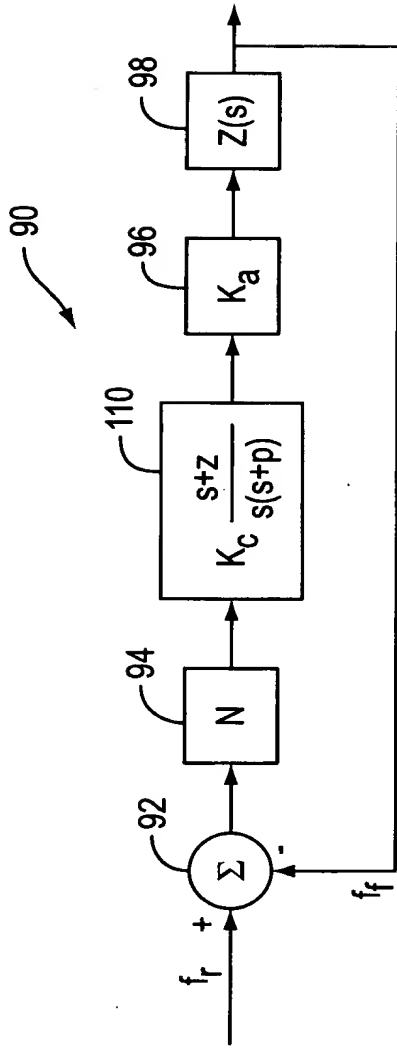


FIG. 16

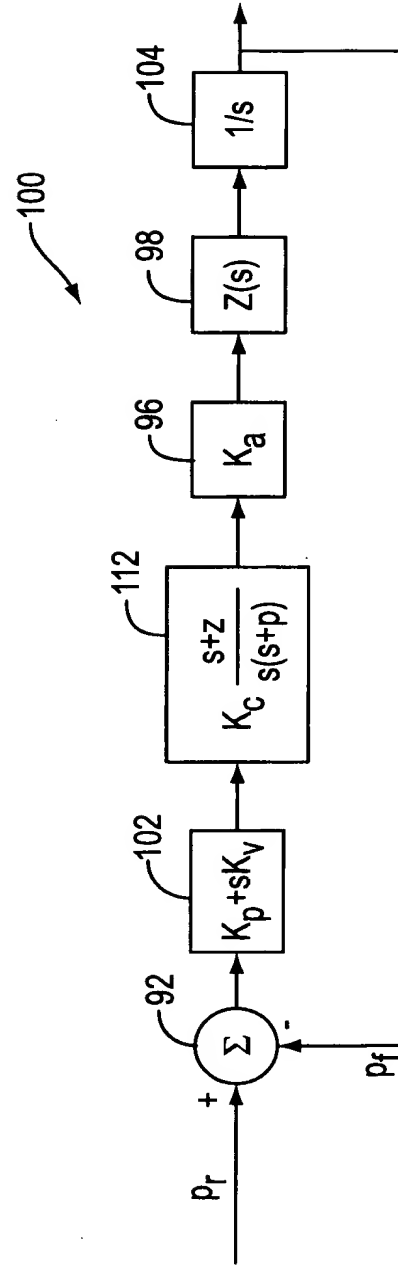


FIG. 17

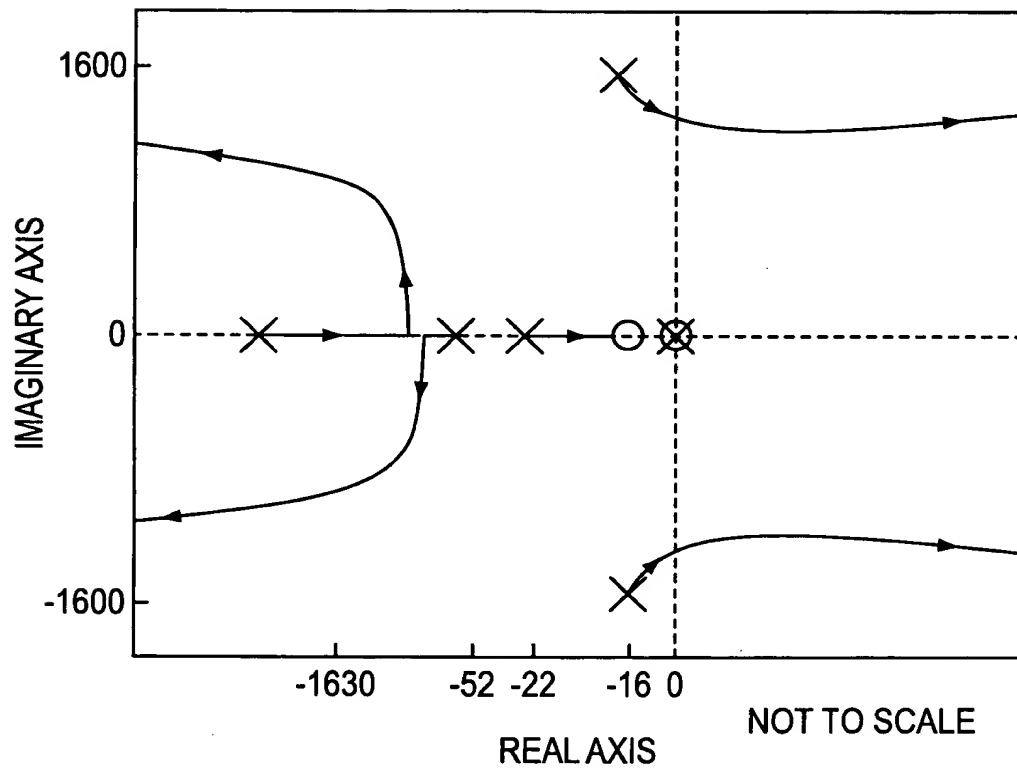


FIG. 18

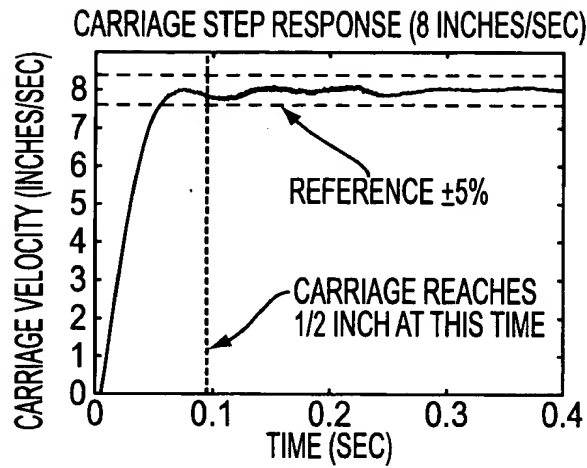


FIG. 19A

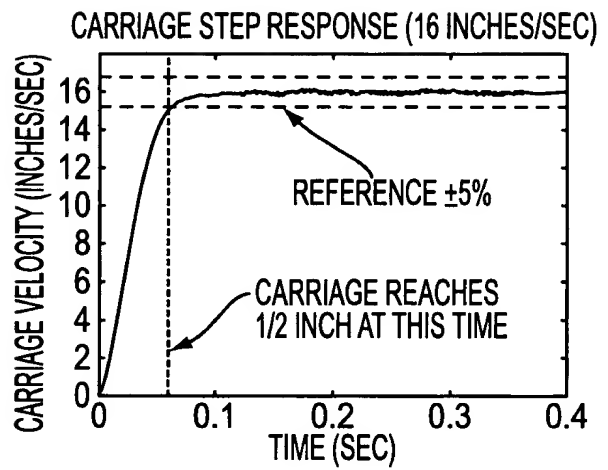


FIG. 19B

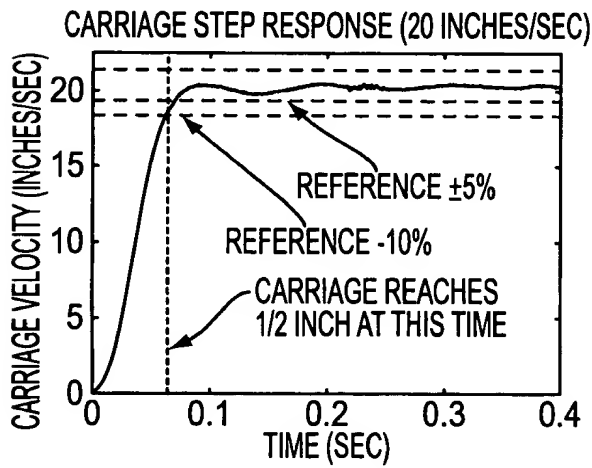


FIG. 19C

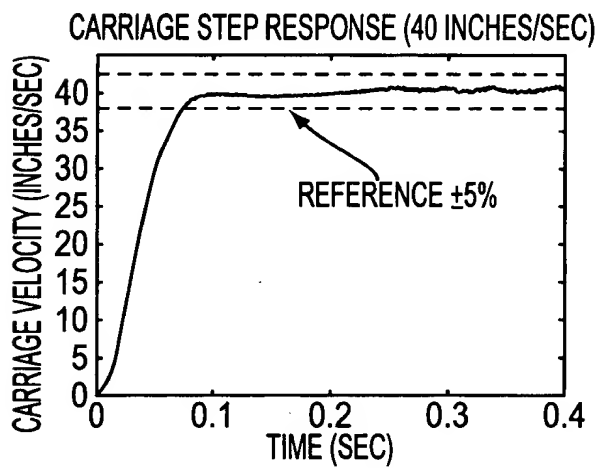


FIG. 19D

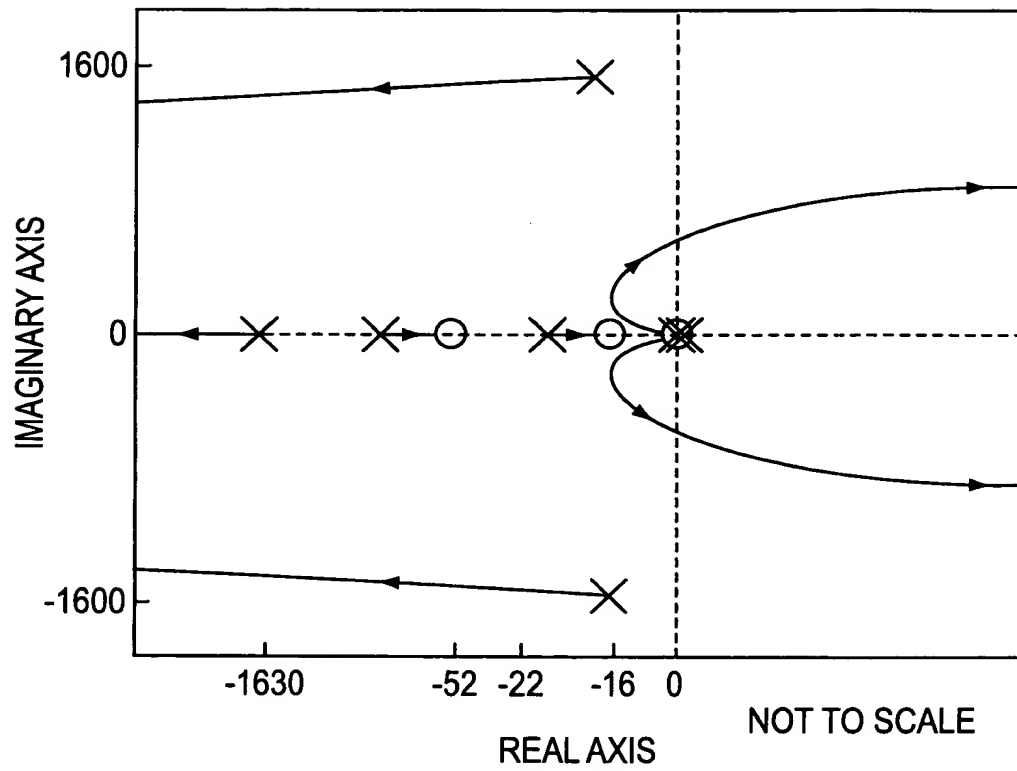


FIG. 20

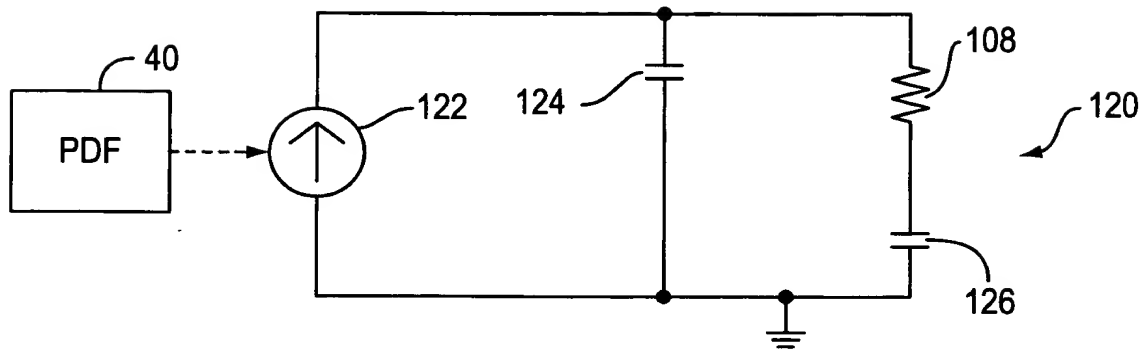


FIG. 21

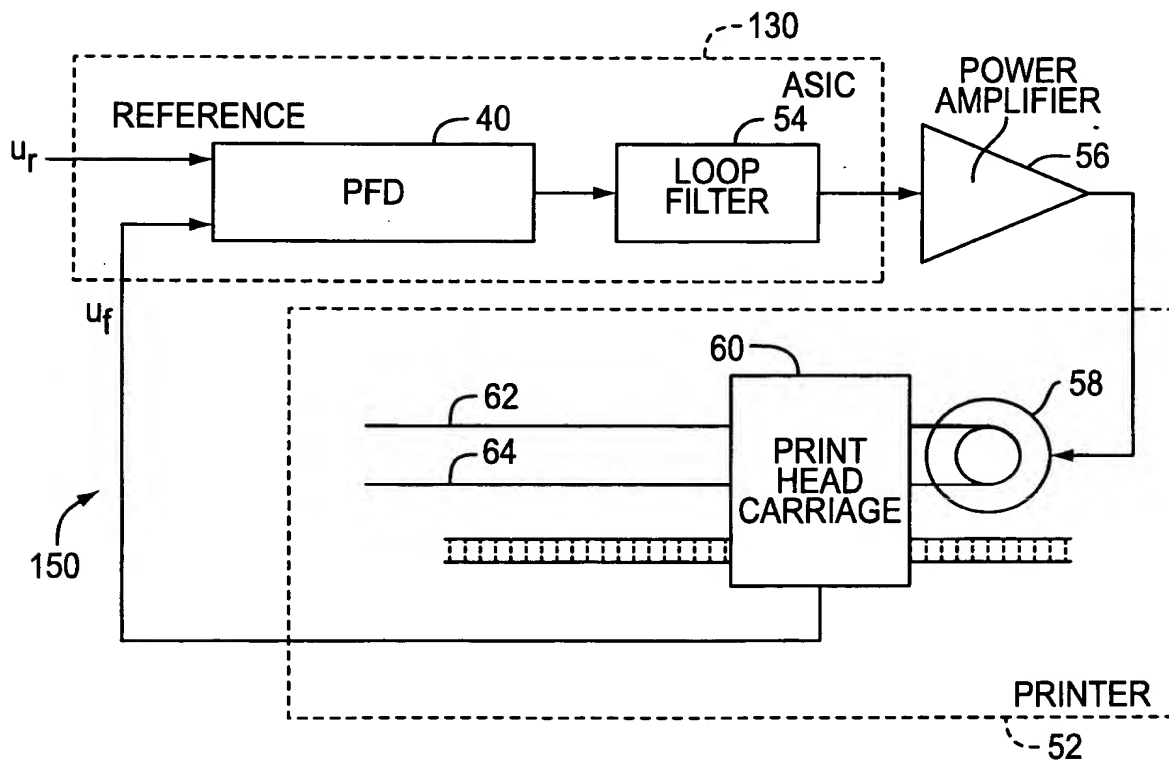


FIG. 23

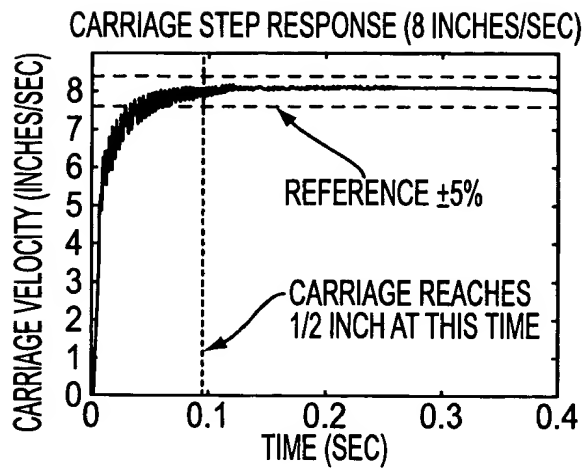


FIG. 24A

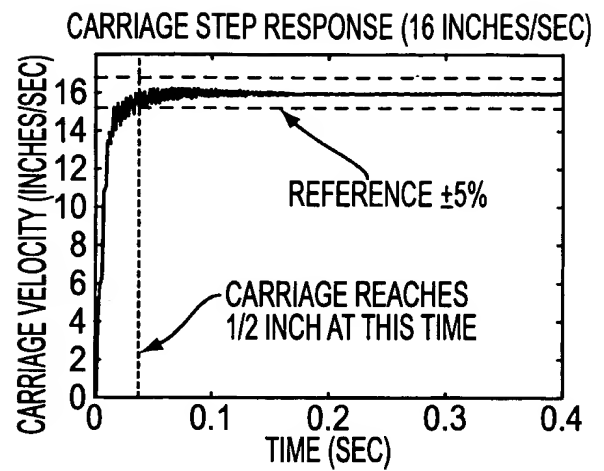


FIG. 24B

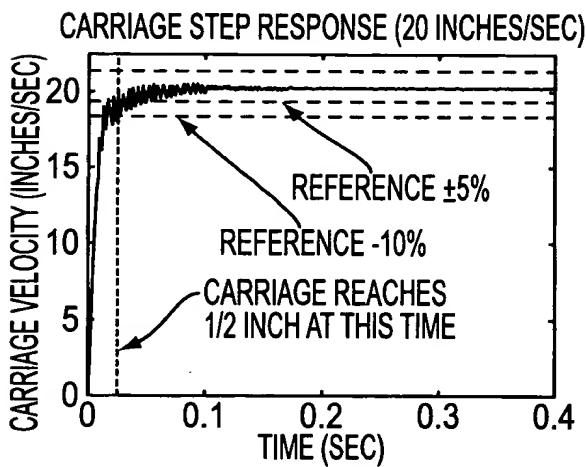


FIG. 24C

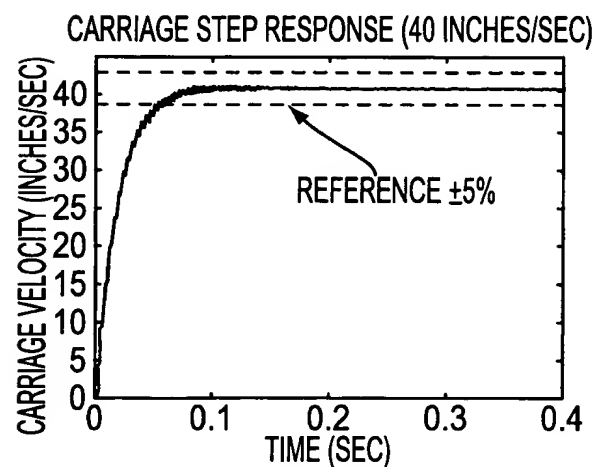


FIG. 24D



CAPACITOR VOLTAGES	PFD "UP"	PFD "DOWN"	PFD "OFF" $V_{c124} > V_{c126}$	PFD "ON" $V_{c124} < V_{c126}$
$V_{c124}$	INCREASES	DECREASES	DECREASES	INCREASES
$V_{c126}$	INCREASES	DECREASES	INCREASES	DECREASES

OPERATION OF ANALOG LOOP FILTER

FIG. 22

PRINT SPEED (ips)	PRELOAD ACCUMULATOR 1	PRELOAD ACCUMULATOR 2	FREQUENCY (Hz) ACCUMULATOR 1	FREQUENCY (Hz) ACCUMULATOR 2
8	500	290	50,000	100
16	800	300	50,000	100
20	900	350	50,000	100
40	900	650	50,000	100

DESIGN PARAMETERS OF ADPLL FOR VARIOUS PRINT SPEEDS

FIG. 25

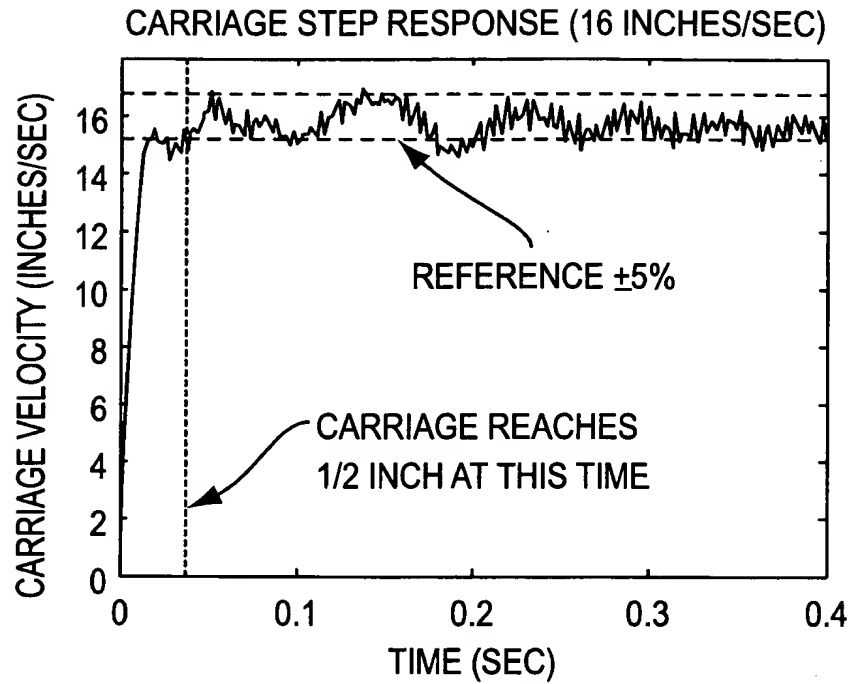


FIG. 26

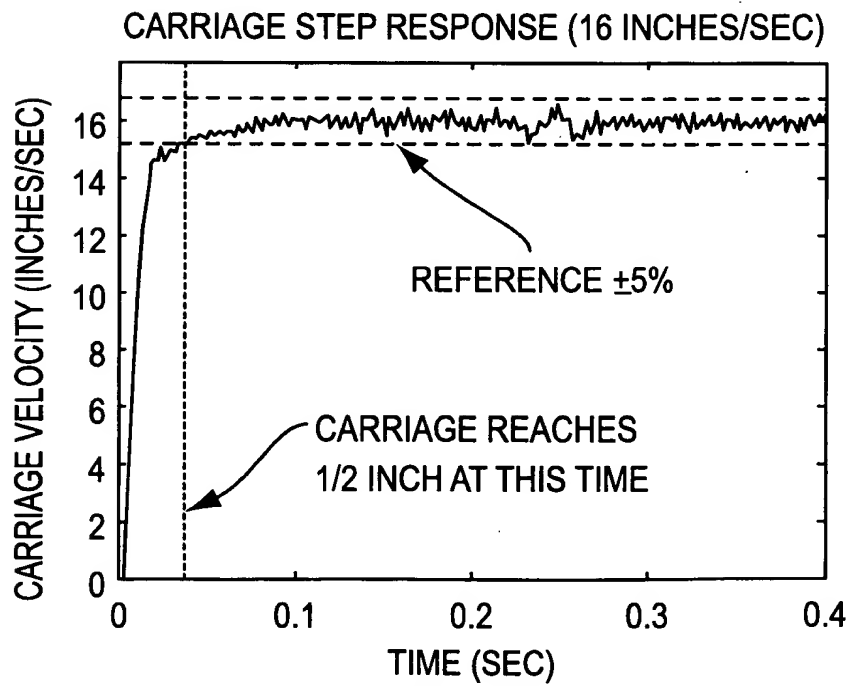


FIG. 28

$u_r - u_f$	$u_r - u_f$	$u_r - u_f$	$u_r - u_f$	UP	DOWN
0-0	0-1	1-1	1-0		
(1)	2	2	(1)	1	1
4	(2)	(2)	7	1	1
4	(3)	2	7	0	1
(4)	5	6	7	1	1
8	(5)	6	9	1	1
4	3	(6)	9	1	1
1	3	6	(7)	1	1
(8)	10	10	(8)	1	1
4	5	10	(9)	1	0
4	5	(10)	(10)	1	1

PFD STATE TRANSITION TABLE

FIG. 27